Testimony Before the

U.S. House of Representatives

Subcommittee on Water Resources and Environment

on

"Expert Views on Hurricane and Flood Protection and Water Resources Planning for a Rebuilt Gulf Coast"

by

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Introduction and Overview

Much of the beautiful Mississippi Gulf Coast and it's highly productive coastal marshes and estuaries was recently devastated by Hurricane Katrina. The entire coastline found itself in the most damaging northeastern quadrant of this category 4 (at landfall) hurricane for some twelve hours. While the property damages caused by this catastrophic event are evident to anyone who has visited the area since the storm and seen first-hand the swathe of total destruction along U.S. Highway 90 and inland for several blocks, the affects on sensitive coastal ecosystems and the renewable natural resources that depend upon them are less evident to the casual observer.

Unquestionably, the destruction to man-made coastal resources – harbors, marinas, piers, jetties, beaches and the like as well as the destruction of homes and businesses – could have been partially avoided or at least minimized if hurricane protection structures had been in place. Wider beaches, larger barrier islands, a more extensive dune system, and more expansive coastal marshlands are some examples of hurricane protection that would simultaneously also serve to improve and enhance coastal ecosystems, essential fish and shellfish habitats, and available habitat for shorebirds, mammals, reptiles, amphibians, and other estuarine-dependent aquatic species.

The Mississippi Sound and the adjoining waters of the open Gulf of Mexico lie in an area long known by fisheries biologists as the Fertile Fisheries Crescent. Home to a wide variety of estuarine-dependent species including spotted sea trout (*Cynoscion nebulosis*), red drum (*Sciaenops ocellatus*), blue crab (*Callinectes sapidus*), Eastern oysters (*Crassostrea virginica*) and Penaeid shrimp of various species, this area also supports some of the nation's most productive recreational and commercial fisheries. The total economic impact of the Mississippi commercial seafood industry for 2003 was over $900 million and employed nearly 17,000 people. Mississippi's recreational fishermen took over one million trips in 2004 and had an economic impact of $170 million.

The prolific fisheries productivity that the waters of the Fertile Fisheries Crescent enjoy is dependent on the coastal marshes and freshwater inflows that provide habitat and suitable salinities for the larvae and juveniles of many of these species. In the westernmost reaches of Mississippi Sound near the Louisiana state line, the Pearl River and the Bay of St. Louis which receives flows from the Wolf and Jourdan Rivers provide the necessary freshwater to ensure the vitality of Mississippi's most productive oyster reefs near the mouth of the bay. This oyster complex includes Square Handkerchief reef, St. Joseph's Point Reef, Buoy Reef, Waveland Reef, Pass Christian Tonging Reef and Pass Marianne and Telegraph Reefs. These reef complexes comprise approximately 10,000 acres. Less extensive oyster reefs are also present in waters south of Jackson County, encompassing some 1,500 acres. Based on preliminary resource surveys, all of these productive areas suffered extensive damage as a result of

silting, sediment deposition, and scouring from the waves generated by Hurricane Katrina. The original reef structure is, no doubt, intact beneath these sediments, but revitalization efforts in the form of a combination of cultch deposition and turning over covered oysters is needed to restore these reefs to their former level of productivity. In recent years, these oyster reefs produced an average of some 400,000 sacks of oysters annually with a dockside value to the fishermen of over $7 million. The economic impact of Mississippi's oyster industry in 2003 was $100 million and employed some 2200 people.

The loss of fish and shellfish nursery habitat resulting from Hurricane Katrina and the loss of fisheries infrastructure, boat dockage, public access, seafood processing capacity, etc. will adversely impact the area's economy. Sewerage and other infrastructure damages have resulted in direct inflow of untreated sewage into coastal habitats. Stormwater drainage systems are damaged and significantly infiltrated with untreated sewage. These destroyed systems must be repaired and expanded to allow our nursery habitats and their dependent resources to fully recover and flourish. If the area's economy is to rebound in the near term, dramatic and immediate action is in necessary. Some 60% of the state's shrimp fleet was either destroyed or heavily damaged by Katrina, and a significant portion of the seafood processing sector met with a similar fate. With assistance, Mississippi's fishing and processing capability will successfully rebuild in the short term to meet the needs of the industry.

Mississippi's offshore barrier islands include Petit Bois, Horn, Ship, and Cat Islands – the islands comprising the Gulf Islands National Seashore. This island chain, located some 12 miles south of coastal Mississippi, provide a natural first line of defense against hurricanes and other tropical storm systems. Such is the nature of a barrier island system. Unfortunately these natural barriers have suffered from a series of onslaughts – first by Hurricane Camille in 1969 which created a major breach in Ship Island, then by Hurricane Georges, which breached Horn Island, and several years later Hurricane Ivan which caused further damages, and, most recently, Hurricane Katrina. Katrina alone destroyed over 2000 acres on these four islands. Deer Island, Mississippi sole inshore barrier island, lost nearly 25% of its total 430 acres and some 70% of its vegetative cover to Hurricane Katrina. As important as the acres actually lost, the elevation of the remaining island footprints has been reduced to near sea level through almost complete destruction of all island dunes and at least 50% of all island vegetation. These damaged barrier islands, along with Deer Island located immediately south of the City of Biloxi, are in danger of further catastrophic erosion without extensive and immediate mitigation and beach, dune, vegetation (trees and undergrowth), and marsh restoration. Coastal vegetated marshes and submerged aquatic vegetation (seagrass beds) also serve the Mississippi Gulf Coast by providing critical essential fisheries habitat and also buffer the effects of coastal storm surges. The overall footprint of vegetated mainland coastal marshes remains similar to that before Katrina, but the elevation of these marshes and particularly the upland areas immediately to their north has been reduced significantly, making them, and the landward areas which they protect, extremely vulnerable to future hurricanes. Seagrass beds, or submerged aquatic vegetation (SAV), which in 1999 covered almost 3000 acres of Mississippi waterbottoms, now occupy less than 300 acres, a 90% loss of these critical fish and shellfish habitats due directly to Hurricane Katrina.

Offshore, Mississippi's artificial reef program was extensively damaged by Hurricane Katrina. These reef areas, created through a partnership between MS DMR and Gulf

Fishing Banks and funded by the Mississippi Legislature, local governments, and the private sector, created artificial fishery habitat by placing derelict vessels, concrete rubble, and other structures at specific locations in federal waters offshore from Mississippi. These areas provide habitat for numerous recreationsl and commercial fishes, including red snapper, red drum, grouper, amberjack, jack crevale, sharks, and other species important to the economic robustness of our charter boat and recreational fishing industries. The economic impact of Mississippi's artificial reef program is $80 million annually.

The sea grass beds along the leeward shores of the islands have slowly deteriorated over the years, but the adverse cumulative effects of successive hurricanes have hastened their demise. Many of the coast's estuarine dependent species utilize these essential sea grass habitats as prime nursery grounds for the development of larvae and juveniles. The spotted sea trout, the most popular species among the state's saltwater recreational fishermen, is among them. If these grass beds are not restored, sea trout populations and the economically valuable recreational and charter fisheries that depend upon them will be adversely affected.

Mississippi's spotted sea trout hatchery, a joint venture of the MS Department of Marine Resources and USM's Gulf Coast Research Laboratory, was completely destroyed by Hurricane Katrina and must be rebuilt if we are to continue our efforts to restore and supplement this critical recreational fishing resource.

Cultural and historical coastal resources that were damaged or destroyed by Hurricane Katrina include the Seafood Industry Museum in Biloxi, Beauvoir - Jefferson Davis' historic home and once the capitol of the Confederacy, the historic Ship Island Lighthouse, which only recently had been reconstructed, the Old Brick House, the oldest structure on the Mississippi Gulf Coast, and the J.L. Scott Marine Education Center, to name but a few. That Hurricane Katrina destroyed the heart and soul of the Coast would be a gross exaggeration. That she erased many cherished monuments to its historical charm and beauty, however, is clear. While the Mississippi Gulf Coast attracts many visitors with its dockside gaming, others come to the area for its traditional charm, southern hospitality, its rich cultural heritage seafood, and recreational and charter fishing opportunities. The value of the historic and cultural resources to the multi-million dollar tourism industry of the Coast is incalculable and must be restored.

Congress in 2004 authorized establishment of the Coastal Mississippi National Heritage Program within the U.S. Department of Interior and in 2005 appropriated some $250,000 to initiate this program. Additional appropriations to this program would significantly expedite the restoration of historical and cultural resources.

An emerging ecotourism industry focused on birding and related natural resource activities also suffered damages as a result of hurricane impacts to shorebird habitat and public access facilities. Restoration of birding nature trails and habitat areas is key to maintaining the vitality of this developing industry.

Proposed Action

Our plan presents a two-phase approach. Phase 1 focuses on restoring Mississippi's natural storm defenses, flood control capacities, and coastal habitat functions to pre-Hurricane Katrina levels. Phase 2 addresses restoration and enhancement efforts to return these capabilities and functions to pre-Hurricane Camille levels. Both phases will also investigate some additional non-natural defenses such as breakwaters, seawalls, and other mechanical storm surge diffusion approaches. The time frame for this plan is 15-20 years. We anticipate completing Phase 1 activities in the short-term, 1-5 or so years, with Phase 2 efforts beginning in near term and extending out some 20 years.

The magnitude of work required to restore storm protection and flood control capacities, coastal environments, and critical habitats to their former state can only be accomplished through the synergism of a multi-agency (Federal and State), private sector initiative. Our plan proposes that federal assistance be provided to the state of Mississippi through a variety of mechanisms involving multiple federal agencies, including but not limited to the U.S. Army Corps of Engineers (USACOE), the U.S. Environmental Protection Agency (USEPA), the National Oceanographic and Atmospheric Administration National Marine Fisheries Service (NOAA-NMFS), the U.S. Department of Interior (USDOI), the U.S. Fish and Wildlife Service (USFWS), the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) and others that may be appropriate.

Much of the anticipated restoration efforts will likely be possible through specific funding to the USACOE, Mobile District. The Mississippi Department of Marine Resources has a long-standing working relationship with the U.S. Army Corps of Engineers in the areas of wetlands permitting and associated marsh, beach, and other habitat restoration efforts. For example, the MS DMR has been partnering with the Mobile District of the USACOE for nearly three years to implement a Beneficial Use of Dredged Materials Programs at DMR. This program, designed to use dredged materials produced from Corps and other (county, casinos, private citizens) maintenance dredging efforts to restore coastal marshes rather than dispose of them offshore or in landfills, has recently enabled the DMR and the Corps to cooperatively restore a 55-acre marsh area on the northeast tip of Deer Island, the first step in our planned restoration of Deer Island to its 1900 footprint. While Katrina did damage the newly restored marsh, some 70% of the area survived, giving credence to our belief that restoration done right will indeed survive further attacks by hurricanes and add significantly to the storm protection afforded by these areas to Mississippi's populated mainland. There are two additional smaller coastal marsh habitats in Jackson County and one in Hancock County that have been restored by the Corps using dredge materials, and all three of these areas survived Katrina unscathed.

We anticipate that multiple regulatory, environmental, and local political entities will be involved in providing guidance and prioritization to these storm protection, flood control, and habitat restoration efforts. In addition to the federal agencies already mentioned, it is important that county Board of Supervisors, city mayors, seafood industry representatives, the recreational and commercial fishing industry, the tourism industry, the MS Department of Environmental Quality, the Gulf States Marine Fisheries Commission, and environmental groups such as the Nature Conservancy and others be included to provide critical guidance to the process of identifying and prioritizing specific approaches and projects that will ultimately lead to the rebuilding of a Coastal

Mississippi that will provide a fertile climate for economic development and environmental stewardship and at the same time guarantee improved protection from future storm and hurricane challenges.

We anticipate that through cooperative efforts by the aforementioned groups, we will identify actions needs to meet the restoration needs of Coastal Mississippi with respect to storm protection, flood management, and habitat restoration. Specific required actions include:

1. **Studies and projects directed at evaluating and mitigating for losses of essential fish habitat, marsh and sea grass areas, oyster reefs, and other critical wetlands habitat.**

Actions would focus on restoration and enhancement of riverine floodplains and near-shore resources. Specific activities would include desnagging and streambed reconfiguring of some tributaries to our major river systems to reduce flood potential, restoration of marsh habitats and beaches, re-establishment of our spotted sea trout hatchery, and restoration of offshore environments, including Mississippi's artificial reefs. Specific restoration efforts would include:

a. Pearl River and Tributaries from Jackson to Mississippi Sound
b. Pascagoula Drainage Basin to Mississippi Sound
c. Other Mississippi Rivers and Coastal Watersheds to the Sound (St. Louis Bay and tributaries, Biloxi Bay and tributaries, others)
d. Mississippi Coastal Area Restoration Initiative (restoration of mainland coastal marshes and beaches). An estimated 1050 acres of coastal marshes (and an additional 840 acres of coastal forests) have been severely damaged or destroyed by Hurricane Katrina. These acres must be restored to provide necessary protection from future storms as well as provide critical habitat for fish, shrimp, and shellfish resources critical for the economic recovery of Coastal Mississippi.
e. MS/LA Coastal Studies (water and silt diversions, reduction in saltwater intrusions, fisheries infrastructure restoration, and related projects). These activities will be driven by the needs of Coastal Mississippi and to the extent possible be conducted in concert with Louisiana activities to divert Mississippi River water and sediment critical to the needs of oyster, shrimp, and finfish resources of Coastal Mississippi.
   Historical side-scan sonar and conventional benthic surveys document the pre-hurricane Katrina status of the state's oyster reef resources, and Coastal Preserves aerial surveys of the coast's marshlands provide a similar measure for the wetlands. Identifying specific areas where losses occurred and where restoration should be focused is needed in all three coastal counties.

2. General Investment in Hurricane Protection and General Coastal Ecosystem Restoration:

Hurricane Protection, Flood Control and Infrastructure Restoration efforts are acutely needed in all six coastal Mississippi counties. This program is designed to completely restore all Mississippi barrier islands to their pre-Hurricane Camille footprint and protective level (Phase 2). Hurricane protection would include restoration of coastal marshes and habitats, critical surge reduction safeguards

during hurricanes and tropical storms, to pre-Hurricane Camille status. Mississippi has four barrier islands, Cat, Ship, Horn, and Petit Bois, under the control of the Gulf Island National Seashore, and restoration of these islands would be in concert with the USDOI Gulf Islands National Seashore. A fifth barrier island, Deer Island, is owned by State of Mississippi. DMR has a program in place to restore Deer Island to its 1900 footprint, essentially doubling the present size. Infrastructure restoration would include rebuilding of access and service facilities such as marinas and fuel docks. This program will be implemented in two phases, Phase 1 to restore hurricane protection levels, flood control capacities, and infrastructure capacities to pre-Hurricane Katrina levels and Phase 2 to provide restoration to pre-Hurricane Camille levels.
To minimize future risks, we will identify those areas along the Mississippi Gulf Coast that are most susceptible to hurricane damages and design and implement structural solutions for these specific areas. Construction of coastal marshes, offshore and near shore breakwaters, jetties, and other surge-diffusing structures where appropriate and replenishment of near shore and barrier island beaches would all constitute potential solutions to these problems on a case-by-case basis. The ability of coastal marshes and wetlands to buffer the effects of hurricanes is well-documented, and full advantage should be taken to develop these buffering systems and make them more robust and expansive wherever possible. We need to simultaneously restore public access facilities to provide services to the commercial and recreational fishery and to allow the citizenry access to coastal waters.

2. Wetlands Ecosystem Restoration:

a. Coastal Marsh and Other Emergent Wetlands Restoration
b. Seagrass and Barrier Island Ecosystem Restoration
c. Oyster Reef Ecosystem Restoration
d. Restoration of Historical and Cultural Resources

Among the cultural resources lost as a result of Hurricane Katrina were the recently restored Ship Island Lighthouse, the Round Island Lighthouse near the mouth of the Pascagoula River which was undergoing restoration work, Beauvoir, the historic home of Jefferson Davis, the Old Red Brick House, and the Church of the Redeemer and Tullis-Toledano Manor in Biloxi as well as Grass Lawn in Gulfport. The Seafood Industry Museum and the J.L. Scott Marine Education Center in Biloxi were also destroyed. In fact, among the structures of historical and cultural significance along the Coast, the Biloxi Lighthouse is one of the few that remained undamaged by Hurricane Katrina.

The aforementioned broad categories of projects can be best served by various funding sources including emergency appropriations to the existing partnerships between the MS Dept. of Marine Resources and the U.S. Army Corps of Engineers, NOAA's National Marine Fisheries Service, USDA's NRCS, the private sector, and others.

The Mississippi Gulf Coast is faced with recovering from the greatest natural disaster in this nation's history. Such a daunting challenge also presents unprecedented opportunities. It is in the best interest of the region, and indeed the nation, that this recovery be expedited. In its present state with weakened

natural buffers, the Coast is at risk of even greater damages from future hurricanes, and more will inevitably be on their way. It is incumbent upon us as wise stewards of our coastal resources to strive towards minimizing these risks by bolstering Coastal Mississippi's natural buffers – our barrier islands and coastal marsh ecosystems.

CURRICULUM VITAE

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Education: B.S., 1967, Botany/Microbiology, Southeastern Louisiana University
M.S., 1970, Soil Microbiology/Biochemistry, Mississippi State University
Ph.D., 1972, Soil Microbiology/Biochemistry, Mississippi State University

Professional Experience (abbreviated):

Executive Director, MS Department of Marine Resources, 1141 Bayview Avenue, Suite 101, Biloxi, MS 39530, July 2002 - present.
USEPA Fellow, Office of the Honorable Trent Lott, U.S. Senate, March - December, 2002.
Chief, Ecological Diagnostics Branch, U.S. Environmental Protection Agency, National Health and Environmental Effects Laboratory, Gulf Ecology Division, 1 Sabine Island Drive, Gulf Breeze, FL 32561-5299, 1997-2002.
Associate Director for Research, University of Southern Mississippi, Institute for Marine Sciences, Gulf Coast Research Laboratory, Ocean Springs, MS, 1996-1997.
Assistant Director for Research and Senior Research Scientist, Gulf Coast Research Laboratory, Ocean Springs, MS, 1991-1996.
Senior Research Scientist and Head, Toxicology Section, Gulf Coast Research Laboratory, Ocean Springs, MS, 1884-1997.
Microbiologist, Gulf Coast Research Laboratory, Ocean Springs, MS, 1972-1984.

Research and Teaching Interests:

Fate and Effects of Pesticides/Toxins in Natural Environments.
Bioassay Evaluations (Bioaccumulation, Food Chain Transfer, Sub-lethal Effects).
Toxic/Carcinogenic Responses in Small Fish Species.

Grant History: About $7.1 million over career. Major funding agencies include U.S. Environmental Protection Agency, National Toxicology Program, National Biological Service, Department of the Army (DOD), National Cancer Institute (NIH), and private industry.

Publications: Over 40 peer-reviewed articles; over 100 national and regional presentations.

DEPARTMENT OF MARINE RESOURCES
FEDERAL GRANTS

Description	Grant Number	Federal Amount	Match Amount	End Date
NOAA Coastal Zone Management	NA05NOS4191057	1,237,000	1,145,000	12/31/2006
NOAA Grand Bay NERR Operations	NA03NOS4200137	540,000	231,149	3/31/2006
EPA Riverine	CD974501	449,884	200,000	12/31/2005
NOAA IJ Monitoring & Assessment	NA04NMF4070183	295,287	73,000	1/31/2007
DOI Artificial Reef	F126-6	142,500	47,500	2/28/2006
DOI Clean Vessel	V-8	75,673	25,225	5/31/2006
DOI Clean Vessel	V-9	93,000	31,000	5/31/2006
DOI Clean Vessel	V-10	16,500	5,500	10/21/2005
DOI Clean Vessel	V-11	47,250	15,750	10/21/2005
DOI Coordination	F118-8	135,000	45,000	3/31/2006
DOI Boating Infrastructure	Y-6	100,000	33,333	11/30/2005
DOI Striped Bass	F95-15	56,250	18,750	1/31/2006
EPA Long Leaf Pine	MX9743900	35,000	0	1/31/2006
NOAA Grand Bay NERR Construction	NA03NOS4630185	5,961,000	0	9/30/2006
DOI Sportfish Studies	F131-5	194,640	71,601	11/30/2005
DOI Outreach	F122-5	135,000	45,000	8/31/2008
DOI Sportfish Tag & Release	F132-5	89,404	29,801	11/30/2005
DOI Sportfish Access	F80-11	127,500	42,500	5/1/2006
NOAA Coastal Zone Management	NA04NOS4190046	1,445,000	1,353,000	12/31/2005
NPS Heritage		161,000	0	
DOI Boating Infrastructure	Y-4	100,000	33,334	2/28/2006
DOI Studies of Coastal Shark	F137-1	39,964	13,331	12/31/2005
NOAA Grand Bay NERR Operations	NA05NOS4201101	580,000	237,858	3/31/2007
NOAA Grand Bay NERR Construction	NA05OS4201151	630,000	270,000	3/31/2007
EPA HGM Guidebook	CD97450202	150,000	50,000	12/31/2005
NOAA Oyster Relief Disaster	NA05NMF4540037	1,545,000	6,876	1/31/2007
NOAA NMFS Statistical	NA04NMF4340061	162,800	0	3/31/2006
NOAA Grand Bay NERR Operations	NA04NOS420000	580,000	235,715	3/31/2006
JEA Enforcement Agreement		1,500,000	0	6/30/2005
JEA Enforcement Agreement		500,000	0	6/30/2005
TOTAL		**17,124,652**	**4,260,223**	